

REMARKS/ARGUMENTS

Claims 1-18 are active in the case. Reconsideration is respectfully requested.

Applicants' representative wishes to thank Examiners Gillespie and Sergent for the helpful interview of January 23, 2007. As a result of the discussion it is believed that the issues in the case have been clarified and that the prosecution of the application has been materially advanced.

The present invention relates to radiation curable compounds having capped amino groups.

Specification Amendments

The specification has been amended in order to provide the same with appropriate section headings. Entry of the amendments is respectfully requested.

The specification at pages 14 and 15 have been amended in order to make a minor correction thereto with respect to radicals R^4 and R^5 , since if these terms are to include hydrogen as a component, then the functional group $-NH_2$ becomes redundant. Entry of the amendments is respectfully requested.

Claim Amendments

A number of the claims have been amended in order to correct minor errors therein and in order to make improvements in language text. None of the amendments are believed to have introduced new matter into the case. Entry of the amendments into the record is respectfully requested.

Claim Rejection, 35 USC 112, Second Paragraph

Claim 3 has been amended by deleting reference to a component (e) and have amended the claim by using the transitional phrase of “consisting essentially of,” thus essentially limiting the claim to only components (a), (b), (c), (d) and (f).

Claim 3, as well as Claims 1, 2, 9, 10 and 17 have been amended by deletion of the phrase “if desired” therefrom in favor of the term “optional.” Further, the amendments made to Claims 8 and 11-13 are believed to be sufficient to obviate the objections which have been raised. Withdrawal of the rejection of the claims is respectfully requested.

Invention

The objective of the present invention is to provide a polyurethane that is curable by radiation or which can be cured by dual cure or multicurable techniques. The polyurethane of the present invention has the advantages of having low viscosity and good surface qualities. The present polyurethane is prepared by reacting the following substances:

- a) at least one organic diisocyanate or polyisocyanate,
- b) at least one compound comprising at least one isocyanate-reactive group and at least one free radically polymerizable unsaturated group and/or cationically polymerizable group,
- c) at least one compound comprising at least one isocyanate-reactive group and at least one capped amino group and having a molecular weight below 1000 g/mol,
- d) optionally, at least one compound comprising at least one isocyanate-reactive group and at least one actively dispersing group,
- e) optionally, at least one compound comprising at least two isocyanate-reactive groups, and

f) optionally, compounds other than a) to d) comprising at least one isocyanate-reactive group, the allophanate fraction being 5 to 65 mol % based on the lowest molecular weight allophanate molecule.

Claim Rejection, 35 USC 103

Claims 1-18 stand rejected based on 35 USC 103(a) as obvious over Bradford et al, U. S. Patent Publication 03/83397 in view of Baumgart et al, U. S. Patent Publication 03/104132 and further in view of Arora et al, U. S. Patent 4,912,154. This ground of rejection is respectfully traversed.

The Bradford et al reference is relevant to the present invention as claimed insofar as it discloses a dual cure coating composition for the topcoating of surfaces to provide the same with a hardened, surface protecting coating. As described in paragraph [0023] of the publication, the coating composition is comprised of three components identified as (a1) a radiation curable material, (a2) a thermally curable binder component and (a3) a thermally curable crosslinking component. The radiation curable (a1) component is an oligomeric or polymeric material (see [0039]). In greater detail the binder (a1), which is radiation curable is selected from oligomer or polymer classes of the likes of (meth)acryloyl-functional-(meth)acrylic copolymers, polyether acrylates, polyester acrylates, epoxy acrylates and urethane (meth)acrylates (see [0042]). The (a2) component is a thermally curable binder material (see [0051]) which has at least two isocyanate groups and is an oligomer or polymer material such as a (meth)acrylate copolymer, a polyester, an alkyd, an amino resin or the like (see [0053]). As described in Example 1 and in Table 1, the two oligomeric or polymeric binders (a1) and (a2) are combined with other ingredients to formulate one component of a coating composition. The preparation of a coating composition is then made complete by adding an isocyanate compound to the composition. Suitable isocyanate compounds (a3) are

described in paragraph [0065] of the publication. Upon curing of an applied formulation on a surface, the isocyanate component acts as a cross-linking agent which cross-links oligomeric or polymeric chains of the two binders, thus forming a hardened surface coating.

From the discussion above concerning the reference, it is clear that the reference does not disclose a polyurethane formulation that is prepared by reacting three essential materials which are (1) a diisocyanate or a polyisocyanate, (2) at least one compound that has at least one isocyanate-reactive group and at least one free radically polymerizable unsaturated group and/or cationically polymerizable group, and (3) at least one compound that has at least one isocyanate-reactive group and at least one capped amino group and having a molecular weight below 1000 g/mol. The polyurethane is also characterized by having an allophanate fraction of 5 to 65 mol %, which is based on the lowest molecular weight allophanate molecule. There is no teaching or suggestion in the reference of reacting these specific ingredients to form a polyurethane. This pertains particularly to present component (3), because there is no teaching or suggestion of the presence of capped amino groups in a reactant nor any suggestion of success resulting from the presence of a capped amino group in a reactant. It should be noted that Bradford et al nowhere teaches or suggests that their component (a2) contains amino groups (capped or uncapped), but only hydroxyl groups containing component (see paragraphs [0053] to [0057]). Further, the reference does not teach or suggest the present polyurethane, because it is particularly apparent that the reference does not employ a diisocyanate or polyisocyanate as a coreactant with two other individual types of compounds to form a polymer (a polyurethane), but rather uses a diisocyanate or polyisocyanate as a means of cross-linking two different types of oligomeric or polymeric materials which function as binders! In Table 1 of Example 1, two different polyesters are used as the binder components of a coating composition.

The deficiencies of Bradford et al are believed to be neither overcome nor improved by the disclosure of Baumgart et al. Baumgart et al discloses a coating, adhesive and sealing composition that is prepared from two basic materials which are a polymeric material (A) [0012] and an adduct (B) [0016]. The polymeric material (A) is at least one (meth)acrylate copolymer having an OH number of 130 to 200. This polymeric material is combined with an adduct [0016] that is formed by reacting at least one diisocyanate (b1) [0017] with a cyclic organic compound of formula (I) that has an isocyanate reactive functional group. A variant of this generally formalized compound is an oxazolidine compound of formula IV [0143]. Two especially preferred of such compounds are the two 1,3-oxazolidone compounds of paragraph [0146]. Thus, it is clear that embodiments of the adduct of the reference can be polyurethanes formed by the reaction of two of the essential ingredients which lead to the polyurethane of the present invention which are the (a) diisocyanate or polyisocyanate ingredient and ingredient (c) which is at least one compound comprising at least one isocyanate-reactive group and at least one capped amino group and having a molecular weight below 1000 g/mol. Nowhere shown or suggested by the reference, however, is the third essential reacting monomer of the invention for forming the claimed polyisocyanate which is component (b). Thus, the reference fails to teach or suggest the polyurethane of the invention. Moreover, it is clearly apparent that even upon combination of the references, one of skill in the art could not be possibly led to the present invention since neither reference describes the preparation of a polyurethane by reacting a diisocyanate or a polyisocyanate with two other specific reactants each containing at least one isocyanate reactive group with each being characterized as having at least one other specific functional group! The role of the di- or polyisocyanate in each of the references is different. In Bradford et al, the isocyanate reactant is a cross-linking agent. In Baumgart et al the isocyanate monomer solely

reacts with a compound containing an isocyanate reactive group to form a urethane copolymer.

It is also observed that the Examiner states in paragraph 5 of the Office Action that Baumgart et al discloses a polyurethane coating that consists of polyisocyanate, free radically polymerizable hydroxyl-containing unsaturated monomers and oxazolidines. While it is true that composition component (B) of the reference is an adduct (a polyurethane) formed by reacting a polyisocyanate with an oxazolidine compound as described in paragraphs [0016-0025] of the publication, the (free radically) polymerizable hydroxyl-containing unsaturated monomer, on the other hand, is **not** a reactant that is used to form the adduct (B), but rather is the monomer that is extensively used to prepare the binder component (A) of the disclosed and claimed coating composition which is a (meth)acrylate copolymer. Clearly, Baumgart et al fails to suggest the present invention.

The deficiencies of the above references are neither overcome or improved by Arora. The Arora patent is clearly of relevance to the present invention because it discloses the preparation of polyurethanes by reacting a diisocyanate with a very specific heterocyclic reactant that contains an oxazoline ring system. While the oxazoline compound shown at the bottom of column 2 of the patent satisfies the requirement of component (c) of the present claims of containing at least one isocyanate reactive group by virtue of the presence of the two methylol groups at position 4 of the oxazoline ring, the nitrogen ring atom of the compound is not a "capped" amino group as required of component (c) of the present claims. Moreover, a third reactant, which is identified as an acid functional compound such as 1,2-dihydroxypropionic acid, 2,3-dihydroxypropionic acid or the like, is not an essential reactant of the present claims from which the claimed polyurethane is made. Accordingly, the polyurethane disclosed in the patent is quite unlike that of the present invention. Moreover, in view of the significant distinctness of the subject matter of the Arora et al patent from the

disclosures of Bradford et al and Baumgart et al, it is clear that any attempt to combine all three references in a matter to suggest the present invention fails. Withdrawal of the rejection is respectfully requested.

Claim 6 stands rejected based on 35 USC 103(a) as obvious over Bradford et al, U. S. Patent Publication 03/83397 in view of Baumgart et al, U. S. Patent Publication 03/104132 and further in view of Bruchmann et al, U. S. Patent 5,744,569. This ground of rejection is respectfully traversed.

Claim 6 is a dependent claim upon which patentability of the invention does not depend. Rather, the claim depends upon an independent claim that is patentably distinguished from the references deemed of greater significance to the invention as claimed and therefore is patentable on this basis. Moreover, whereas the stated requirement of component (c) of the present claims is that the compound contain at least one capped amino group and that it be used with component (b) in reaction with a diisocyanate or a polyisocyanate, the disclosure of aldimines and ketimines in column 4 of the Bruchman et al patent is in the context of a one-component polyurethane coating composition that is comprised of only reactive components having blocked isocyanate-reactive groups. Compound A of the reference is one such compound. Other reactive components that have blocked isocyanate-reactive groups include aldimines and ketimines. Thus, the Bruchman et al patent does not improve upon the primary documents and withdrawal of rejection is respectfully requested.

With regard to the IDS of record in this case, in a telephone conversation with applicants' representative, the Examiner acknowledged that the four foreign references indicated as not considered by virtue of the deleting lines in Form 1449, were, in fact, considered by the Examiner. Correction of the Form 1449 by the Examiner is respectfully requested.

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It is now believed that the application is in proper condition for allowance. Early notice to this effect is earnestly solicited.


Respectfully submitted,

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